'Club of Economics in Miskolc' TMP Vol. 12., Nr. 1., pp. 9-18. 2016. http://dx.doi.org/10.18096/TMP.2016.01.02

Hungarian Energy Prices in an OECD Comparison

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SUMMARY

The goal of the study is to assess the effect of the utility cost reductions announced by the Hungarian government in 2012 on Hungarian energy prices. The effects are discussed in an OECD comparison. It is concluded that the government price control has resulted in a 15% steeper price reduction occurring 5-7 quarters earlier, compared to other OECD countries. The price reductions saved around 202 billion HUF for Hungarian households in 2014, which was around 0.63% of the GDP. If prices are compared to the monthly average wages however, household energy prices are still high in Hungary. One of the costs of the reduction in household energy prices was an increase in energy prices for industry: the industry/household price ratio is highest among OECD countries in the case of natural gas, and third highest for electricity.

Keywords: electricity, Hungary, natural gas, price control, utility cost reduction

Journal of Economic Literature (JEL) codes: E64, Q41

DOI: http://dx.doi.org/10.18096/TMP.2016.01.02

INTRODUCTION

Energy price developments, and especially the threat of ever-increasing future prices, have been a focus area in energy-relatedresearch. In a paper published in 1949, M. King Hubbert suggested that the discovery rate of fossil fuels can be best described with a logistic curve. His paper generated a lot of discussion and lead to the framing of the well-known peak oil theory. The peak oil theory seemed to reflect reality, until the 1970s and 1980s. Oil production in the United States peaked at 9.6 million barrels per day in the 1970s (EIA), while the two oil crises of the same decade pushed oil and energy prices to new heights (see Figure 1).

Starting from the mid-1980s, however, a different trend emerged: prices had fallen close to their pre-1971 values, and there was no significant change in the next two decades. Oil prices then peaked again in the early 2000s, but this latest peak coincided with the shale gas and oil revolution. As a result of increased shale oil extraction, the US oil production nearly reached its 1970s peak, with 9.4 million barrels a day in 2015(EIA). Although in 2012-13 oil prices broke the 100-dollar ceiling, a huge drop in prices followed after that, and according to the forecasts made by the World Bank, no dramatic changes can be expected until 2025 (see Figure 1).

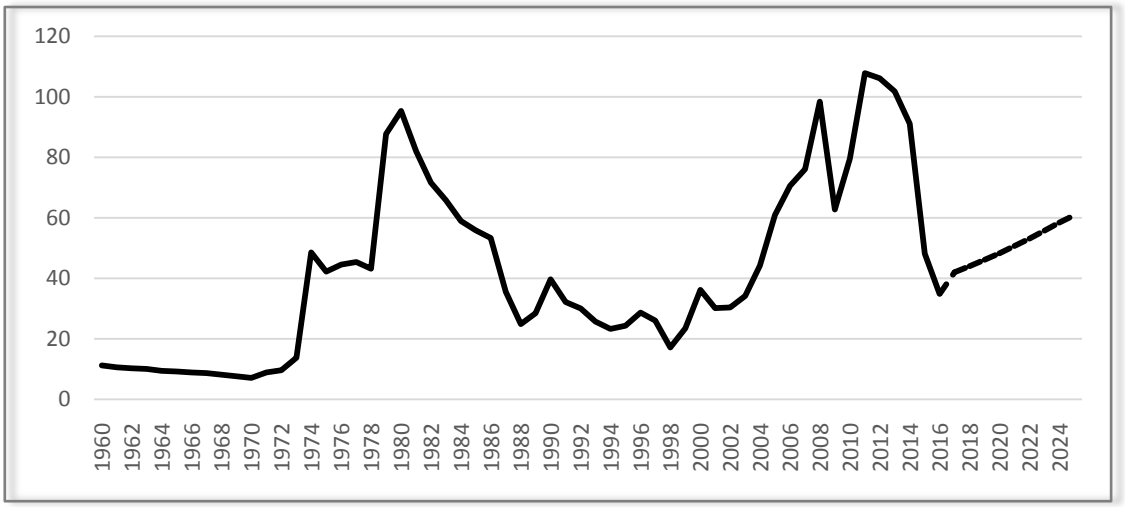

Figure 1 Oil price per dollar (measured in 2010 US dollars; Arab Light price until 1985, and North Sea price until 2015; later prices coming from the forecast of the World Bank)
Source: Own calculations based on IEA, OECD and World Bank data

According to recent calculations and estimates, global oil production is expected to peak between 2010 and 2030. Sorrellet al. (2010) conducted a meta-analysis focusing on 14 research papers written on the topic, and they conclude that a later-than-2030 peak can only be estimated if very optimistic or even unrealistic assumptions are made. It could well be that we will reach the oil peak in this decade (although global oil production kept rising until 2014 – the latest year that EIA data is available at the moment), so the threat of drastically increasing energy prices cannot be discarded.

In Hungary, energy prices had become one of the most discussed public issues after the government interventions announced at the end of 2012. This study starts with a short overview of the government price control interventions in Hungary, and its goal is to show the effect of the government intervention on energy prices. This effect will be shown in a comparative approach, by comparing the Hungarian trends tothose of the OECD ones.

Energy price controls in Hungary

The state minister responsible for the Cabinet Office of the Prime Minister announced in a press conference held at Budapest Zoo on 6th December 2012 that the government would decrease the price of household gas and electricity by 10% starting from 1st January 2013 (*Index* 2012). During the next two years the utility cost reduction was one the most important message in government communication. In a series of legislation changes the Hungarian parliament decreased the price of many public utilities (see Table 1).

Table 1
Government price control interventions in public utility services in Hungary, 2012-15

Time	Intervention
1 January 2013	10% decrease in household gas and electricity prices
1 July 2013	10% decrease in LPG prices
1 November 2013	11.1% decrease in household gas, electricity and district heating prices
1 April 2014	6.5% decrease in household gas prices
1 August 2014	3.3% decrease in district heating prices
1 September2014	5.7% decrease in household electricity prices

Source: own work

By 2015 the waves of the utility cost reductions seemed to have settled down. According to *HVG*, a weekly newspaper focusing on business and politics, the Hungarian minister for justice expressed his government's willingness to change the public utility price control system in a letter sent to the EU commissioner responsible for the energy union in May 2015 (*HVG* 2015). However, the topic of low energy prices continue to be featured in the government communication. In a speech given by the prime minister during the 2014 election campaign, the topic of energy prices was even given a whole new perspective. The prime minister announced that it was his government's goal to make Hungary the most industrialised country in Europe, and part of this vision was that Hungary would have the lowest industrial energy prices in Europe as well (*Magyar Nemzet*2014). Similar announcements have been made by other government members since then. The need for cheap energy for the industrial sector was an argument used to support the idea of constructing a new nuclear power plant, as well.

DATA AND METHODS

The following data sources were used during the analysis:

- STADAT database of the Hungarian Central Statistics Office (HCSO): https://www.ksh.hu/stadat
- Energy consumption statistics provided by the Hungarian Energy and Public Utility Regulatory Authority (EPURA): http://www.mekh.hu
- Energy prices and taxes database compiled by the International Energy Agency (IEA): http://dx.doi.org/10.1787/eneprice-data-en
- OECD database (OECD): http://dx.doi.org/10.1787/data-00285-en
- US Energy Information Agency database (EIA): http://www.eia.gov
- World Banks's Commodity Markets database (WB): http://go.worldbank.org/4ROCCIEQ50
- Hungarian National Bank's exchange rate database (MNB): http://www.mnb.hu

IEA was the primary source of data, but EIA, OECD or World Bank data were also used in case of missing values or time series not available in the IEA database. Long-time series data for oil prices (e.g. Figure 1) was created by combining different spot prices (Persian Gulf prices and Northern Sea ones). This method does add some distortion to the analysis, but the use of it can still be justified since oil prices in different regions are closely matched.

MS Excel was used for the calculations (regression, significance values, trends and distributions), and for the creation of figures.

RESULTS

Household energy prices dropped considerably between the last quarter of 2012 and the first quarter of 2015. The drop was universal; it affected markets with government control (e.g. household electricity and gas prices), but markets with little government control also (e.g. fuel prices). Figure 2 illustrates the price trends for the 2012Q4-2015Q1 period. The first quarter 2015 household electricity price was only 61.5% of its last quarter 2012 value; the household gas price dropped to 64% of its 2012 Q4 value. These are very significant changes, and the rate of decrease is much sharper than the price decreases dictated by the government regulations (which would have meant around a 25% cut in prices).

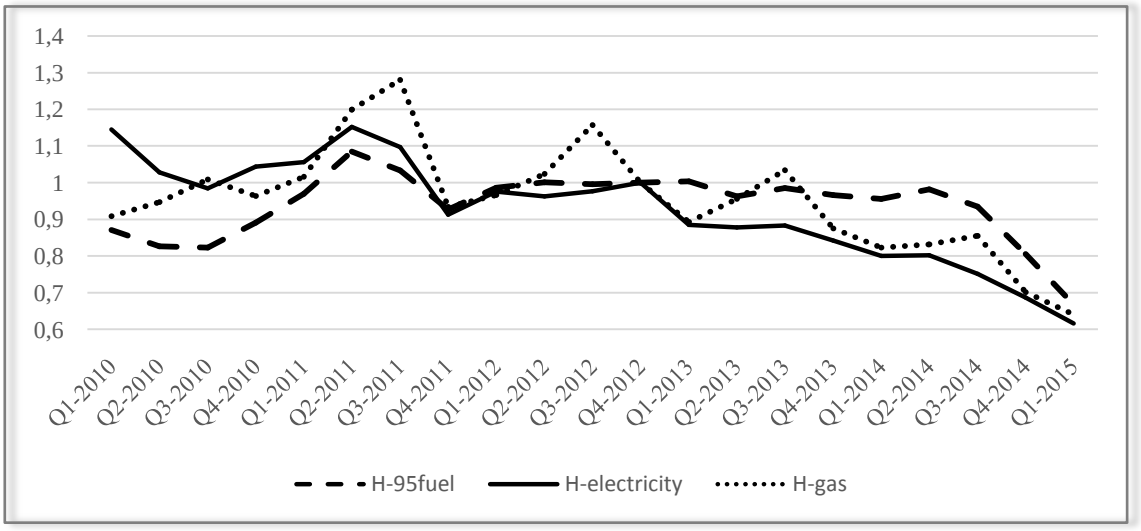

Figure 2 Change in unleaded 95 fuel, household electricity and gas prices in Hungary (last quarter of 2012=1)
Source: own calculations based on IEA data

The price of unleaded 95-octane fuel decreased to 67% of its 2012 value in the same period. Fuel prices are mostly influenced by the price of oil: since 2004, 94% of the changes in the price of the 95-octane fuel in Hungary is explained by the changes in the North Sea oil price. The same value is 96% in the OECD on the average. The same is only partially true of household gas and electricity prices: in the period 2004-2012 only 46% of the household gas prices and 49% of the household electricity prices were explained by the oil price variations. Based on the price data analysis we can conclude that household energy prices would have dropped in Hungary even without government intervention, however the rate and the timing of the change would have been different.

- Without intervention, the decrease in household energy prices would have only been around 15%, instead of the actual 36% (gas) and 38% (electricity). So the utility cost reduction added an extra 20% price reduction for households (58% of the whole change was caused by the price control in case of gas, and 61% in case of electricity). This argument is supported by at least two statistics. As was mentioned above, fuel prices are almost completely determined by oil price variations; the interdependence between oil prices and the price of gas and electricity on the other hand is below 50%. If fuel prices dropped by 33% in the 2012Q4-2015Q1 period, the interdependences would indicate an estimated 15% drop in gas and electricity prices. On the other hand we can also check what happened with household energy prices in other OECD members from the region (countries considered: Austria, Czech Republic, Estonia, Germany, Poland, Slovakia and Slovenia), where the price setting system was not changed after 2012. The drop in household gas prices was 19%, while for household electricity prices it was 14% in the seven selected OECD countries.
- Without intervention, the drop in prices would have only begun in the second part of 2014, and not as early as the beginning of 2013. Oil prices only started to come down in the second part of 2014. Household gas prices in the European OECD members peaked in the second quarter of 2014, and the peak in the household electricity prices in the European OECD countries was in the first quarter of 2014.

Table 2

Hungary's rank in household energy prices among OECD members (n=34),rank in low household energy prices

Component		Quarter 4 2012	Quarter 1 2015
Unleaded 95-octane fuel			
	Hungary's rank	13th	8th
	No. of missing countries (no data available)	1	2
Household electricity			
	Hungary's rank	16th	5th
	No. of missing countries (no data available)	4	4
Household natural gas			
	Hungary's rank	5th	4th
	No. of missing countries (no data available)	6	6

Source: own calculations based on IEA data

Table 2 reveals that the utility cost reduction had considerably improved Hungary's position on the list of OECD members with cheap household energy prices. In the first quarter of 2015 Hungary had the fourth lowest household gas price in the whole OECD, which meant a 1 place improvement compared to the last quarter of 2012. The three NorthAmerican countries were the only ones ahead of Hungary in 2015, and Turkeywas overtaken.

In the case of household electricity prices, Hungary's jump is more spectacular: from the 16th place in 2012 the country had leapt to 5th place. In fact, in the first quarter of 2015 Hungary had the lowest household electricity price in the European Union. The cheapest four countries were Mexico, South Korea, Norway and the United States (no data is available for Canada).

Somewhat surprisingly, Hungary's position improved on the list of the 95-octane fuel price as well: 8th in 2015 compared to 13th in 2012. However, the difference in fuel prices is not large within the European Union, so a shift of a few places is not necessarily an indication of a different price trend.

Analysis of the natural gas prices

Both Figure 2 and Table 2 show that the reduction in household gas prices in Hungary was significant, and much steeper than the OECD average. If industrial prices are considered as well, the picture changes somewhat. Figure 3 shows how the Hungarian household and industrial gas prices changed compared to the OECD average in every quarter of the 1993-2015 period. While the household gas price had decreased by around 25-30% compared to the OECD average (in the 2012 Q4-2015 Q1 period), and in the first quarter of 2015 it was only 78% of the OECD average, the price of industrial gas had risen from 174% of the OECD average to 189% of it. In the eight quarters of 2013–2014 Hungarian industrial gas prices were 1.71times higher than the OECD average, which is the highest 8-quarter average for the 1993-2015 period (Hungarian industrial gas prices were 1.68times higher in 2011-12; 1.63times in 2009-2011; 1.66times in 2007-2009; 1.21 times in 2005-2007; and 1.1 times in 2003-2005).

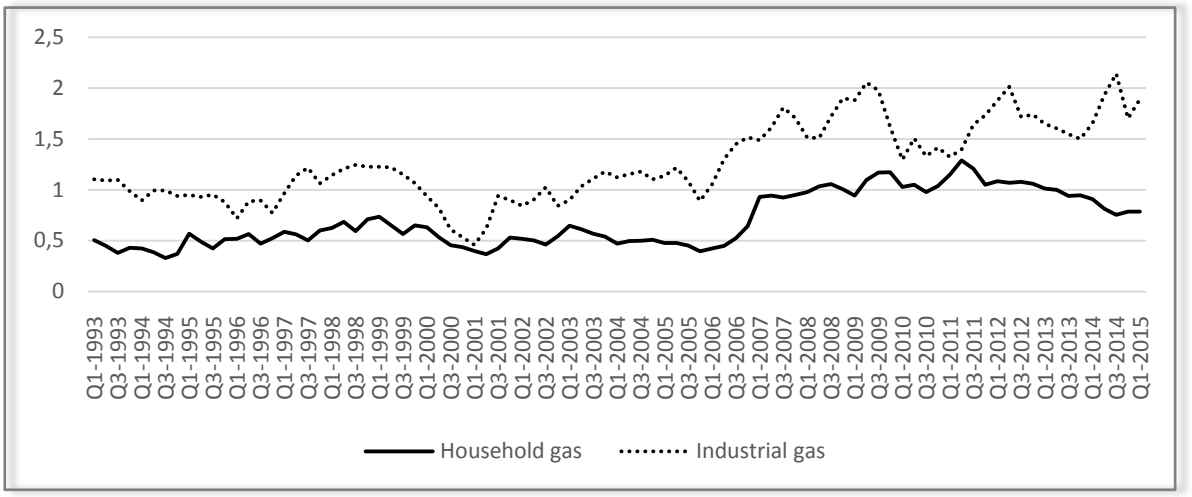

Figure 3 Hungarian industrial and household gas prices compared to the OECD average (OECD average=1)
Source: own calculations based on IEA data

Caution is advised when Figure 3 is interpreted. Natural gas still does not have a world market, and its price changes from continent to continent. There is a big difference in the spot market natural gas price within Europe as well: due to the lack of competition, prices tend to be higher in the central and eastern part of the continent (Barnes&Bosworth 2015). Hungarian prices, and especially Hungarian industrial prices, seem to be so high compared to the OECD average because prices in NorthAmerica are much lower as a result of the shale gas revolution (Duangnate et al. 2015; Horváth, 2014). In the beginning of 2015 the price of natural gas in the United States was only 41% of the average of the European OECD members, meaning that gas prices in Europe are almost 2.5 times higher.

Figure 3, on the other hand, makes it clear that industrial gas prices have risen in Hungary compared to the OECD average. The decreasing trend of household prices and the increasing trend for industrial prices have brought Hungary back to the old system of having higher prices for industry. In the OECD industrial prices are around half of the household prices on average, but starting from 2014, industrial gas prices have exceeded household prices in Hungary,just as they did before 2008 (see Figure 4). This is a unique Hungarian phenomenon; in all other OECD members industrial prices are much lower than household prices(in Estonia and Turkey, where the two prices are closest to each other, industrial prices are 76% and 80%, respectively, of household prices).

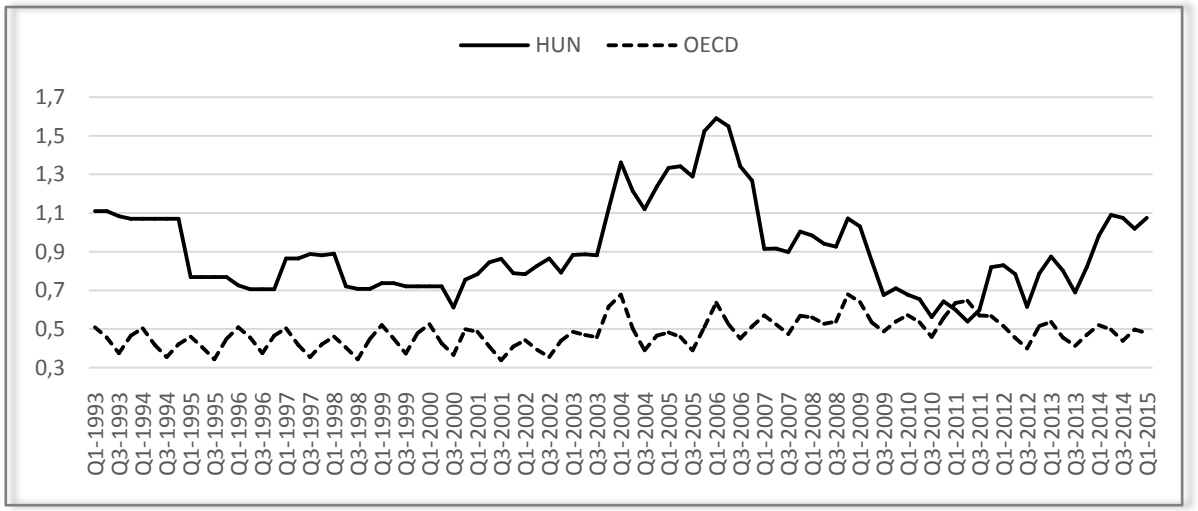

Figure 4 The price of industrial gas compared to the price of household gas in Hungary and in the OECD
Source: own calculations based on IEA data

But international comparison is only one of the possible approaches to the assessment of energy price costs. One of the government messages arguing for the utility cost reduction was that energy prices should be compared to the income of households. Since some data is available on household incomes for the OECD members, this comparison can also be done. OECD provides data on the average annual wages measured in the local currency. One can convert these values to US dollars using the average annual exchange rate, and the household gas price can then be expressed as the ratio of the average US dollar wage. If we multiply this ratio by 12, we get the cost of purchasing one unit household natural gas as a share of the average monthly wage in a country.

The result of these calculations is shown in Figure 5. Figure 5 only consists of countries for which the 2012 and 2014 quarter 4 household gas price and the 2012 and 2014 annual average wage data were available. Countries are ranked according to the share of one unit (1 megawatt hour, MWh) of household natural gas cost within the monthly average wage in the final quarter of 2014 (dotted bar). The same calculations were made for the final quarter of 2012 (black bar).

Comparing the dotted and black bars, one can observe that no major changes took place in the 2012-14 period. We have data for 23 OECD countries, and among the 15 "cheapest" countries (where 1 MWh equivalent of natural gas had the lowest share within the average monthly wage) there were only two changes in places: the United Kingdom and Belgium swapped the 7 and 8th places, and Spain and Slovenia the 14th and 15th places. Hungary made the biggest improvement, but this was only enough to climb from the 19th to the 16th place. In most countries the burden of buying a unit of natural gas had decreased (Portugal was the only country where it increased, while it basically remained unchanged in the US, Canada and Spain). Hungary had clearly had the largest decrease: in two years the share of household gas in the monthly average wage had decreased by around 30%, while the OECD average drop was only 10%.

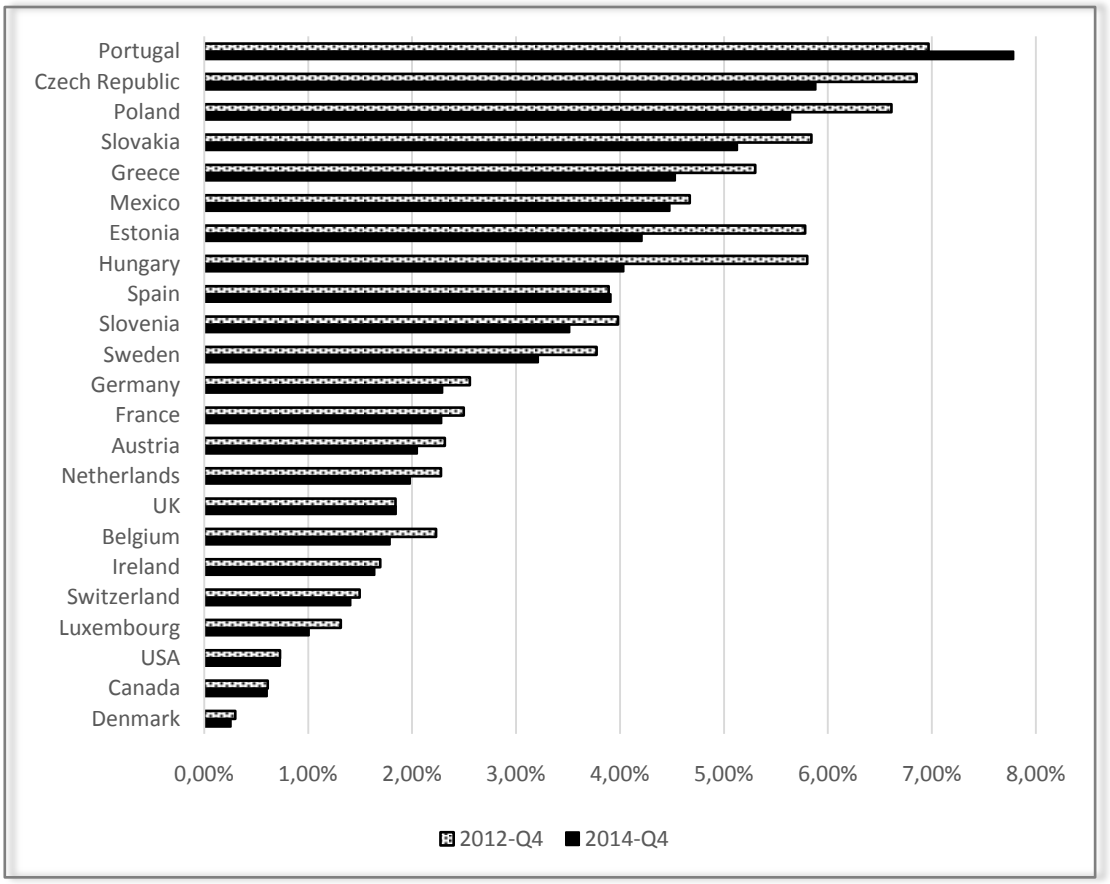

Figure 5 The price of 1 MWh equivalent natural gas as a ratio of the average monthly wage in the OECD
Source: own calculations based on IEA and OECD data

We can also calculate the amount of money saved by Hungarian households as a result of the household gas price drop. The database of the Hungarian Energy and Public Utility Regulatory Authority provides statistics on the monthly household natural gas consumption in gigajoules (GJ). The GJ values can be converted into MWhs, and the result of this calculation is shown by column 2 of Table 3. Using the IEA database we can also find by how much lower the 2014 prices were than in the final quarter 2012 value (column 3). Multiplying column 2 and 3 gives us the amount of US dollars saved by Hungarian households in a given quarter of 2014. Using the quarterly average exchange rate of the Hungarian National Bank we can find the forint value of column 3 (column 4). The total amount of savings on household gas consumption coming from the drop in prices compared to the final quarter of 2012 is 83 billion Hungarian forints, which is around 0.26% of the 2014 Hungarian GDP, and 0.43% of the total household consumption in 2014.

Table 3
Household savings as a result of the drop in household natural gas prices in 2014 in Hungary

Quarter of 2014	Household gas consumption (MWh)	Price difference (2012-Q4 minus the price of the given quarter, USD/MWh)	Savings (HUF)
Q1	11 604173	10.8369	28 261 799 409
Q2	3172633	10.32799	7 309 976 496
Q3	1580955	8.848871	3 295 126 558
Q4	9823839	18.2574	44 260 105 385
2014 in total			**83 127 007 848**

Source: own calculations based on IEA, HEPURA and MNB data

Analysis of electricity prices

The price of household electricity in Hungary has developed similarly to the trends seen in gas prices (see Figure 6). At the end of 2012 it was slightly above the OECD average (1.2-times higher than the OECD average, but only 87% of the average of the European OECD members). In the following years it began dropping, and by the end of 2014 it had fallen to 84% of the OECD average (59% of the European OECD average). Industrial electricity prices also decreased, but at a much slower pace.

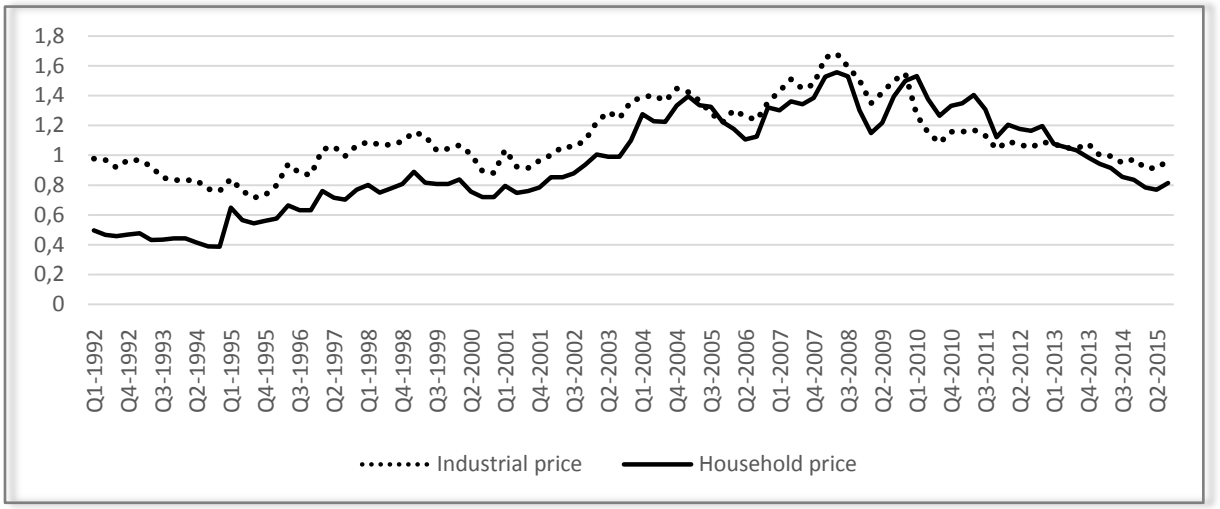

Figure 6 Hungarian household and industrial electricity prices compared to the OECD average (OECD average=1)
Source: own calculations based on IEA data

The relation between household and industrial prices goes against the OECD trends, just as it does in the case of natural gas prices. Between 2008 and 2012 the ratio of the industrial/household electricity price was below the OECD average in Hungary, but starting from 2013 the Hungarian ratio has risen above the OECD average. In the end of 2014 there were only two countries where the industrial/household electricity price ratio was higher than in Hungary (0.81 in Hungary,1.07 in Italy and 1.32 in Mexico). The average of this ratio was 0.7 in the OECD and 0.61 among the European OECD members.

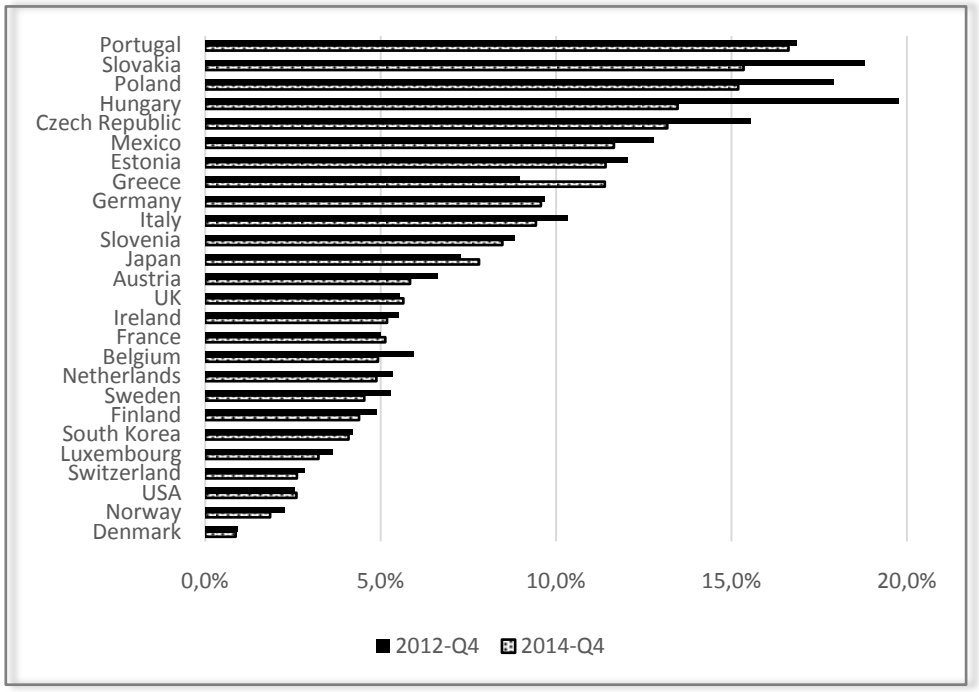

Figure 7 The price of 1 MWh household electricity as a percentage of the average monthly wage in the OECD countries
Source: own calculations based on IEA and OECD data

Figure 7 shows how the household price of 1 MWh electricity compares to the average wages. Data was available for 26 OECD members. The rank of countries is determined by the final quarter 2014 electricity price/average monthly wage ratio (dotted bar). As in the case of natural gas, household electricity prices compared to the average wage dropped in most OECD countries (there was a considerable increase in Greece and Japan, while the ratio had stagnated in some countries). At the end of 2012 Hungary was 26th from 26 countries (1 MWh household electricity cost around 20% of the monthly average wage); by the end of 2014 Hungary overtook 3 countries for the 23rd place (1 MWh household electricity cost 13.5% of the average monthly wage). Compared to the monthly wage, household electricity prices are still very high in Hungary, although Hungary showed the biggest improvement (a drop of 32% compared to the OECD average decrease of 9%).

Applying the method described for the data in Table 3 to household electricity, we can estimate the household savings resulting from the electricity price reduction. Table 4 summarises the results of the calculations. In 2014 a total 119 billion HUF was saved because of lower prices, compared to the last quarter of 2012. This sum was 0.37% of the 2014 GDP, and 0.62% of the total household consumption.

Table 4

Household savings as a result of the drop in electricity prices in 2014 in Hungary

Quarterof 2014	Household electricity consumption (MWh)	Price difference (2012-Q4 minus the price of the given quarter, USD/MWh)	Savings (HUF)
Q1	2 588 599	41.60652	24 205 083 767
Q2	2 421 725	41.31356	22 320 173 671
Q3	2 469 425	51.90004	30 187 575 128
Q4	2 632 099	65.34867	42 445 470 722
2014 in total			**119 158 303 289**

Source: own calculations based on IEA, HEPURA and MNB data

CONCLUSIONS

In late 2012 the Hungarian government announced a new price control system for public utilities (the utility price reduction programme), and starting from 2013 the price of household gas and electricity was reduced in several steps. The study assesses the effect of these reductions in an OECD comparison. The period of analysis is quite large, however the last quarter of 2012 is often used as a benchmark, since that is the time when the price control intervention was announced. The analysis ends in the final quarter of 2014 or in the first quarter of 2015, because no further reductions were announced by the government after 2014. The following conclusions can be drawn after the analysis:

- The price of household gas and electricity fell considerably after the price reductions (by 36 and 38% respectively from the last quarter of 2012 to the first quarter of 2015). There was a drop in household prices across the OECD as well, although the rate of decrease was much slower (13.5 and 12%). Based on the oil price trends, on the sensitivity of gas and electricity prices to oil price changes, and on gas and electricity price trends in other OECD countries, we can conclude that household gas and electricity prices would have decreased in Hungary even without the government interventions, but the rate of the decrease would have been less (only around 15%), and it would have happened later (starting from the second part of 2014 instead of the beginning of 2013).
- The drop in energy prices brought a total of 202 billion HUF savings to Hungarian households in 2014, which is 0.63% of the 2014 GDP, and 1.05% of the total household consumption.
- Within the OECD the price of household gas and electricity expressed as a percentage of the monthly average wage decreased the most in Hungary between the final quarters of 2012 and 2014, but it is still very high in OECD comparison. In the case of both gas and electricity prices Hungary's rank had improved by three places between 2012 and 2014, but that was only enough to go from the 19th to the 16th cheapest country for household gas (from the 23 OECD members for which data was available), and from the 26th to the 23rd cheapest country for household electricity (from 26 OECD members, so in 2012 Hungary in fact had the highest household/monthly average wage ratio).
- The significant reduction in household energy prices had a major distortion effect on industrial prices. While on average the industrial gas price is only around 50% of the household price in the OECD, in 2014 Hungary became the only country

where industrial gas prices rose above household prices. The same anomaly can be detected for electricity prices: Hungary has the third highest industrial electricity price compared to household price within the OECD. The industrial energy price developments make it extremely difficult to realise the government's stated plan to have the lowest industrial energy prices in Europe.

Some of the analyses conducted in the study were made with rather simplified assumptions. When the household savings are estimated, I disregard the fact that if energy prices had been higher, households would have probably consumed less; because of seasonal differences in prices, comparing the last quarter of 2012 to each quarter of 2014 can be slightly misleading; and since IEA provided energy prices in US dollars, changes in the HUF/USD exchange rate might have also distorted the results somewhat. Some of the costs of the utility cost reductions were not discussed in the study. A 2014 report of the European Commission,for example,suggests that investment levels in the electricity and gas sectors have decreased (EC 2014, p. 112).

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DATA SOURCES

EIA: US Energy Information Agency database: http://www.eia.gov

EPURA: Energy consumption statistics provided by the Hungarian Energy and Public Utility Regulatory Authority: http://www.mekh.hu

HCSO: STADAT database of the Hungarian Central Statistics Office: https://www.ksh.hu/stadat

IEA: Energy prices and taxes database compiled by the International Energy Agency: http://dx.doi.org/10.1787/eneprice-data-en

MNB: Hungarian National Bank's exchange rate database: http://www.mnb.hu

OECD: OECD database: http://dx.doi.org/10.1787/data-00285-en

WB: World Banks's Commodity Markets database: http://go.worldbank.org/4ROCCIEQ50